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(54) A method for obtaining preserved meat

(57) Meat is preserved, in a packaged storage at room temperature for six months or more without loss of product acceptability, in cuts typically 3 cm, or less, thick, by

(a) immersion or injection with aqueous saline solution containing sodium chloride and polyphosphate and nitrite ions,

(b) dipping the cuts in a syrup-like bath,

(c) drying and cooking the outer surface of the cuts,

(d) further cooking the cuts so that all points reach at least 75°C for at least 15 minutes,

(e) vacuum packing the cuts,

(f) cooling and freezing the packs, and

(g) irradiating the packs with gamma-radiation e.g. at 2Kgy/min to a total dose of 15—45Kgy.

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SPECIFICATION

A method for obtaining preserved meat

This invention relates to a method for obtaining
 5 preserved meat, starting from e.g. lean beef,
 without tendons. More particularly it relates to a
 method based on the use of gamma-type
 (micromicrowave) radiation, combined with
 traditional treatment of meat with the purpose of
 10 yielding a preserved product which can be stored at
 room temperature for over six months while
 keeping its nutritional value and physical and
 organoleptic characteristics.

At present, refrigerated meat cuts can be
 15 marketed over three days. Frozen meat can be kept
 and marketed over a significantly longer period.
 However, uncooked meat which is not refrigerated
 or frozen has a very limited market especially if it
 comes from an area which has not been declared
 20 free of the foot-and-mouth disease virus.

The method of the present invention sets out to
 preserve meat cuts at room temperatures to give a
 product free from contaminating or degrading
 pathogenic elements, which product can be
 25 marketed for over six months without canning or
 sterilization by autoclave.

In this way, it is possible to supply markets that do
 not have cooling facilities; to provide a substitute
 for preserved foods; to eliminate the cost of low
 temperature storage, handling and/or
 30 transportation; to overcome restrictions imposed
 for sanitary reasons or as preventive quarantine; to
 optimise replenishment intervals for restocking in
 economical and commercial respects; and to
 stockpile products if needed for production or
 35 marketing reasons.

The invention consists in a method for obtaining
 preserved meat which comprises the successive
 steps of

40 (a) treating cuts of meat by immersion into and/or
 injection of an aqueous saline solution of sodium
 chloride, polyphosphate ions and nitrate ions;

(b) removing the treated cuts of meat and
 immersing them into an aqueous syrup-like bath;

45 (c) removing the cuts of meat and treating them
 by a process which dries and slightly cooks the
 surface;

(d) further cooking the cuts of meat in such a
 manner that every point of each cut of meat reaches
 50 and is held at a temperature of at least 75°C for 15
 minutes;

(e) vacuum packing the cuts of meat, individually
 or in groups, within suitable sealed packaging;

(f) cooling and freezing the vacuum packed cuts,
 55 and

(g) subjecting the packed cuts to the effect of
 micromicrowaves.

Results vary according to type of meat, its initial
 contamination level, the exact treatment
 60 combination used and/or the packaging details.

When applying this method, it is preferable to
 select lean beef, with no tendons, first-quality,
 minimum contamination, and with an airing (post-
 slaughter) period not exceeding 2 or 3 days, to give
 65 a premium product.

Cuts are prepared in a cutting-room, equipped
 according to conventional sanitary criteria and
 preferably do not exceed 3 cms thick (i.e. have no
 point further than 1.5 cm from a surface).

70 The cuts are immersed and injected with the
 saline to reduce aqueous activity. Typically, this
 cures the cuts to some extent. They are thereafter
 preferably drained off before immersion in the
 syrup-like bath. They are then cooked until the
 75 surface regions become dry and slightly cooked.
 Subsequently the cuts are further heated by any
 cooking process (boiling, microwaves, baking
 ovens, etc.) until the coldest internal point reaches
 75°C and kept at least at that temperature

80 (preferably not unduly higher) for 15 minutes so as
 to eliminate any enzymatic activity, various viruses,
 microbes and pink liquid.

The cuts are then packed, using a high vacuum. In
 this stage, sauces or seasonings can be added.

85 The vacuum packing should be gas-tight and
 preferably opaque to light and ultraviolet radiation.
 It should also be preferably be able to bear a
 temperature variation up to 50°C and a
 micromicrowave dose not exceeding 50KGy. In such
 90 circumstances a final product of 6 months shelf life
 at room temperature can be obtained.

When packing is completed, each bag is cooled
 down e.g. until about freezing-point (°C) and then
 frozen at a temperature preferably below -30°C by
 95 means of a fast-freezing process.

Lastly, the product is subjected to
 micromicrowaves e.g. by passage through a
 suitable chamber. This operation can be carried out
 once the product has been already packed for its
 100 final marketing: if so each total cut should
 preferably still be colder than -25°C when it is taken
 out of the irradiation chamber. The product absorbs
 a radiation dose of gamma-type radiation
 (micromicrowave radiation or picowave radiation
 105 i.e. of about 10^{-12} wavelength) of more than 15 KGy.
 and less than 45 KGy, e.g. at a rate of 2KGy/min.

EXAMPLE

Lean beef, with no tendons, first-quality,
 110 minimum contamination, with less than 3 days
 since slaughter, is cut in steaks of 3 cms. thick in the
 cutting-up room of a cold-storage plant.

The cut steaks pass through a curing machine
 containing an aqueous solution of 2% of sodium
 115 chloride, 3% of sodium tripolyphosphate, and 25
 parts per million of sodium nitrite. They are then
 drained for 5 minutes.

The cuts are then immersed in an orange-juice
 bath and immediately thereafter exposed to fire
 120 until their surface is slightly roasted.

After this the cuts pass through a microwave oven
 (leaving sufficient space between each cut to make
 sure the cooking treatment reaches all its faces) and
 are cooked therein at not less than 75°C at all points,
 125 and at a temperature just adequate for this purpose.

Cuts are taken to an automatic thermoforming
 and vacuum packing machine. The quantity of cuts
 per bag can vary, but joint packaging of three cuts
 has been found to reduce costs significantly. During
 130 this packaging stage sauces or seasoning can be

added.

A co-extrusion of aluminium-treated polyamide/polyethylene of 300 microns can be used as the thermoformable base of the package. Its upper part is a trilaminate formed by 12 microns of bi-oriented polyethyl-enterephthalate, 10 microns of zero-temper aluminium film, and (as the internal package film) 70 microns of polyethylene. The adhesive used may be an aliphatic polyisocyanate.

The packed product is cooled to a nearly freezing point temperature and then, by means of a fast-freezing process, frozen at a temperature below -30°C . The resulting packages were stored in cardboard boxes, which allow for a stable

temperature and protect them from tearing, piercing, light and ultraviolet radiation. These boxes need be opened only when the packages are to be displayed at retail stores. Apart from any other necessary printed information, boxes can also bear an international radiated-product symbol, which charges colour when receiving a dose higher than 10 KGy.

Boxes enter a micromicrowave chamber for exposure to gamma-like radiation at a dose rate that may reach 2 KGy per minute up to a minimum dose of 15- KGy. The maximum dose will not exceed 35-45KGy. During exposure to radiation, the whole product should preferably have a temperature colder than -25°C .

The end product was capable of keeping its nutritional value, physical, and organoleptic characteristics for at least 6 months on room-temperature storage.

CLAIMS

1. A method for obtaining preserved meat which comprises the successive steps of

(a) treating cuts of meat by immersion into and/or injection of an aqueous saline solution of sodium chloride, polyphosphate ions and nitrate ions;

(b) removing the treated cuts of meat and immersing them into an aqueous syrup-like bath;

(c) removing the cuts of meat and treating them by a process which dries and slightly cooks the surface;

(d) further cooking the cuts of meat in such a manner that every point of each cut of meat reaches and is held at a temperature of at least 75°C for 15 minutes;

(e) vacuum packing the cuts of meat, individually or in groups, within suitable sealed packaging;

(f) cooling and freezing the vacuum packed cuts,

and

(g) subjecting the packed cuts to the effect of micromicrowaves.

2. A method as claimed in claim 1 in which the saline solution contains by weight not more than 3% sodium chloride and not more than 3% of a source of polyphosphate ion.

3. A method as claimed in claim 2 in which the saline solution contains by weight at least 50 p.p.m. of nitrite ion.

4. A method as claimed in claim 2 in which the solution contains by weight not more than 50 p.p.m. of nitrite ion.

5. A method as claimed in claim 3 or 4 in which the saline solution contains not more than 1% of a source of polyphosphate ion.

6. A method as claimed in any one preceding claim in which the cuts are drained of the saline solution before immersion in the syrup-like solution.

7. A method as claimed in claim 6 in which the syrup-like solution is a fruit juice or a sugar solution.

8. A method as claimed in any one preceding claim in which the cuts are of a maximum thickness of 3 cm whereby no internal point is more than 1.5 cm from a surface.

9. A method as claimed in any one preceding claim in which the cooking step (d) is effected by boiling.

10. A method as claimed in any one of claims 1 to 8 in which the cooking step (d) is effected by microwaves.

11. A method as claimed in any one of claims 1 to 8 in which the cooking step (d) is effected by baking.

12. A method as claimed in any one preceding claim in which sauces and/or seasoning are added to the cuts during vacuum-packaging.

13. A method as claimed in any one preceding claim in which, in step (f) the cuts are cooled to about 0°C and then frozen at -30°C or below.

14. A method as claimed in any one preceding claim in which the cuts are subjected in step (g) to a total dose of between 15 KGy and 45KGy at a rate of 2 KGy/min.

15. A method as claimed in any one preceding claim in which the cuts are subjected in step (g) to the micromicrowaves at a temperature below -25°C .

16. A method as claimed in claim 1 substantially as herein specifically described with reference to the Example.

17. Meat preserved by the method as claimed in any one preceding claim.